GROUNDFISH MANAGEMENT TEAM REPORT ON DISCARD MORTALITY RATES APPLICABLE TO THE NEARSHORE FISHERY

As part of the Omnibus process, the Council recommended reevaluation of the discard mortality rates for recreational and commercial fisheries. This report explores potential updates to discard mortality rates for the commercial nearshore fishery. There are three items of which the Council could consider taking action at this meeting (or could defer): (1) reconsideration of 100 percent discard mortality assumption for "sport-like" jig and pole gears in the 20 to 30 fathom depth bin; (2) methodology for applying discard mortality rates if the 100 percent assumption is changed in the 20 to 30 fathom depth bin; and (3) consideration of discard mortality rates reflecting the use of descending devices in the commercial nearshore fishery for "sport like" jig and pole gears.

Section 1: Reconsideration of the 100 percent discard mortality rate assumption for "sport-like" jig and pole gears in 20 to 30 fathom depth bin

In 2008, the Scientific and Statistical Committee (SSC) endorsed depth-dependent mortality rates for rockfish released at the surface that were made applicable to the recreational and commercial nearshore fisheries using "sport-like" jig and pole gears. Since the methods and SSC recommendations used to establish these rates are limited in detail in both the April 2008 SSC report and the 2016 Groundfish SAFE document, the GMT contacted Dr. E.J. Dick, National Marine Fisheries Service (NMFS) Southwest Fisheries Science Center (SWFSC), for more background information regarding the development of these rates. Dr. Dick was one of the primary GMT analysts whom crafted the surface mortality rates in 2008.

Dr. Dick provided the GMT with two presentations that contain detailed information regarding the methods and recommendations used to establish the SSC-endorsed rates. The first presentation contains the proposed methods and rates that were reviewed by the SSC (Appendix 1). The second presentation contains the SSC recommendations and describes changes the GMT made in response (Appendix 2). In this report, the GMT lays out a proposal for modification of the current commercial nearshore discard rates in the 20-30 fathom depth bin.

The alternatives for Council consideration, highlighted in bold, are outlined below. The GMT believes that further SSC review does not appear to be warranted as the question pertains to whether the precautionary buffer that was added to the SSC-endorsed rates should continue to be used.

NO ACTION: Use SSC-endorsed rates plus 100 percent mortality in the 20 to 30 fathom depth bin for "sport-like" jig and pole gear

ALTERNATIVE 1: Use SSC-endorsed rates

To evaluate the alternatives, it is important to consider how the SSC-endorsed surface mortality rates were developed in 2008. As shown in Figure 1, the GMT initially proposed surface mortality rates to the SSC that included five depth bins and were based on the addition of initial-, short-, and long-term mortality probabilities.

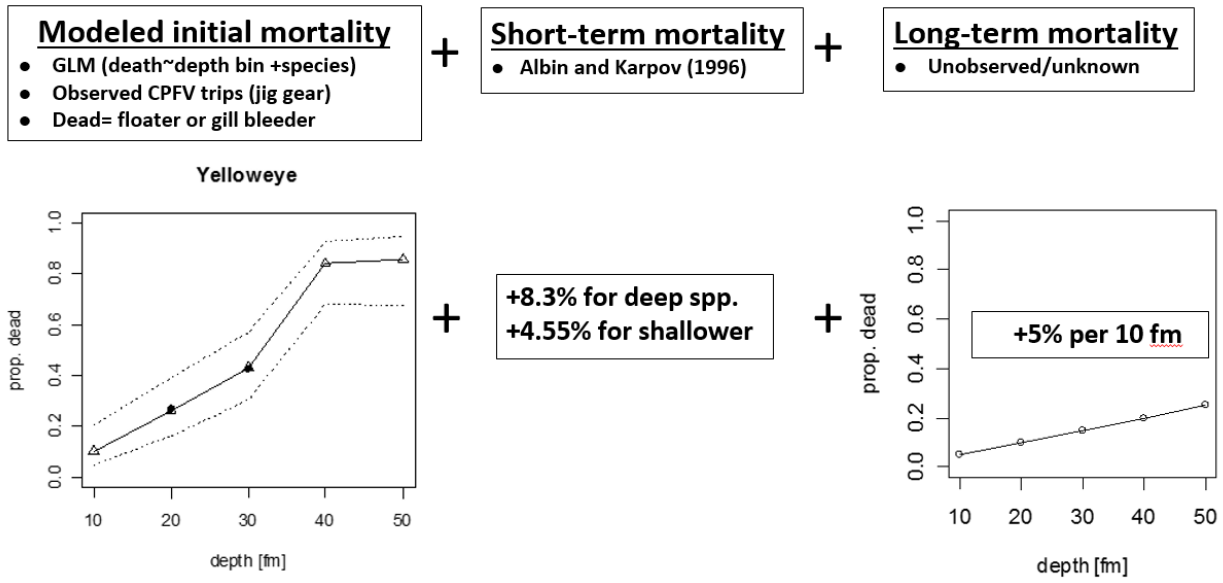

Figure 1. Initial methodology proposed by GMT for surface mortality rates in 2008.

After the initial presentation, the SSC had three recommendations in development of the rates that were later addressed by the GMT (listed in Appendix 2): (1) mortality probabilities are multiplicative, not additive; (2) ensure guild member species are appropriate (guilds are groupings of similar species used for proxies/pooling due to low sample size); and (3) combine the three depth bins deeper than 30 fathoms into a single > 30 fathoms bin with 100 percent mortality as a precaution due to low sample sizes.

However, the recommendation of the current 100 percent discard mortality rate assumption for the nearshore fishery in the 20-30 fathom depth bin for "sport-like" jig and pole gears is not present. This precautionary addition of the use of 100 percent discard mortality was recommended by the GMT at that time, except black and yellowtail rockfish, and was first used in the 2009 West Coast Groundfish Observer Program (WCGOP) estimates.

As seen in Table 1, nearshore jig and pole and recreational gears are treated the same (i.e. both use the SSC endorsed rates) in less than 20 fathoms. The difference in mortality rates lies in that a 100 percent mortality rate assumption is applied for the nearshore commercial fishery in depths >20 fathoms, whereas mortality rates of 29 percent to 63 percent in the 20-30 fathom depth bin are specified for the recreational fishery depending on species (excluding black and yellowtail rockfishes that have uniquely low mortality rates). As a result, the nearshore commercial mortality rates are 37 to 71 percent greater in 20-30 fathoms than the surface rates specified for the recreational fishery (see "Difference" column in Table 1).

Table 1. Comparison of surface mortality rates endorsed by the SSC and those implemented for nearshore commercial jig and pole gears.

	SSC-endorsed surface rates (used by rec)				Nearshore rates (jig & pole)			
Rockfish	**0-10 fm**	**10-20 fm**	**20-30 fm**	**>30 fm**	**0-10 fm**	**10-20 fm**	**>20 fm**	**Difference**
Black	11%	20%	29%	63%	11%	20%	63%	34%
Black & Yellow	13%	24%	37%	100%	13%	24%	100%	63%
Blue	18%	30%	43%	100%	18%	30%	100%	57%
Bocaccio	19%	32%	46%	100%	19%	32%	100%	54%
Brown	12%	22%	33%	100%	12%	22%	100%	67%
Calico	24%	43%	60%	100%	24%	43%	100%	40%
Canary	21%	37%	53%	100%	21%	37%	100%	47%
China	13%	24%	37%	100%	13%	24%	100%	63%
Copper	19%	33%	48%	100%	19%	33%	100%	52%
Gopher	19%	34%	49%	100%	19%	34%	100%	51%
Grass	23%	45%	63%	100%	23%	45%	100%	37%
Kelp	11%	19%	29%	100%	11%	19%	100%	71%
Olive	34%	45%	57%	100%	34%	45%	100%	43%
Quillback	21%	35%	52%	100%	21%	35%	100%	48%
Tiger	20%	35%	51%	100%	20%	35%	100%	49%
Treefish	14%	25%	39%	100%	14%	25%	100%	61%
Vermilion	20%	34%	50%	100%	20%	34%	100%	50%
Widow	21%	36%	52%	100%	21%	36%	100%	48%
Yelloweye	22%	39%	56%	100%	22%	39%	100%	44%
Yellowtail	10%	17%	25%	50%	10%	17%	50%	25%

The question under consideration is whether the mortality rates applied in the management of the nearshore commercial fishery using jig and pole gears in 20-30 fathoms should be 44 to 71 percent greater by species than the rates used in recreational fisheries. More specifically, since the recreational rates were based on observed morality from charter surveys, are there differences between nearshore and charter that would warrant a more precautionary approach with nearshore?

During our discussions, the GMT could not identify specific reasons why surface mortality rates would be higher in the commercial nearshore fishery than the recreational fishery. That is because fishing behavior both charter and commercial nearshore fishermen using jig and pole gears is similar in that they both throw their discards overboard immediately after capture. While there may be differences in handling when using descending devices (discussed in Section 3) as landed

catches may prioritized over those being descended, that is not necessarily the case with surface releases since fish are unhooked as they come in and thrown overboard immediately thereafter. Therefore, there is no need for additional handling as when descending a released fish.

The GMT did discuss that there could be differences in handling between commercial nearshore and charter fishermen using jig and pole gears, but we were unable to determine if one would be better or worse than other. With both, a single crew member can be responsible for attending to multiple lines at a time, and differences in how quickly they can respond to unhooking and discarding fish are not well enough known to compare.

In conclusion, the GMT could not identify a reason why the commercial nearshore fishery might warrant different mortality rates than the recreational sector. In that case, it may be more appropriate for the commercial nearshore fishery to use the original surface rates in all depths (i.e., without need for the 100 percent mortality assumption).

Based on our understanding of the fishery and fishery behavior as presented above, the GMT recommends the Council consider selecting Alternative 1 for commercial nearshore jig and pole gears.

Section 2: Preferred methodology for applying discard mortality rates if Alternative 1 is selected under Section 1.

If the Council selects Alternative 1, using SSC-endorsed discard mortality rates for "sport-like" jig and pole gears in 20-30 fathoms, then the methods used to apply the discard mortality rates for estimates and projections must be modified.

Estimates of discard mortality are produced by WCGOP by multiplying the estimated discards by the discard mortality rate that is supplied by the GMT. For rockfish, WCGOP stratifies their discard estimates across three depth bins (0-10 fathoms, 10-20 fathoms, and >20 fathoms) in order to facilitate application of the depth-dependent discard mortality rates which use the same three bins. Since each depth bin has two different gear-specific discard mortality rates (i.e., 100 percent for longline and pot; surface rates for jig and pole), the GMT created a singular "blended" discard mortality rate for each depth bin based on the proportion of gear use (defined as total landings of target stocks) multiplied by the gear-specific discard mortality rate (Table 1-14; 2016 SAFE document).

As shown in Figure 2, the process for estimating discard mortality currently works well since the depth bins that WCGOP uses to estimate discards are compatible with the adopted depth bins for discard mortality rates. However, this currently only occurs in part due to the 100 percent discard mortality rate assumption in >20 fathoms for jig and pole gears. If the Council chooses the Alternative 1 mortality rates for jig and pole gears, the GMT recommends an additional depth bin be created for discard mortality rates (i.e., >20 fathoms with 100 percent mortality currently should be re-stratified to 20-30 fathoms with intermediate mortality and >30 fathoms with 100 percent mortality). As seen in Figure 3, current WCGOP stratification is based on the binning adopted by the Council. If that stratification changes for management, it would compel a change in the WCGOP analysis.

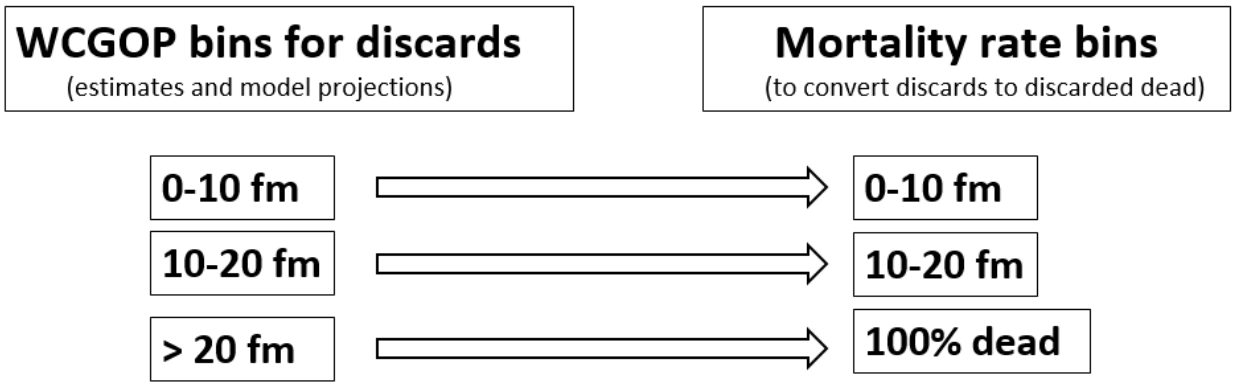

Figure 2. The three WCGOP depth strata currently in use with the associated mortality.

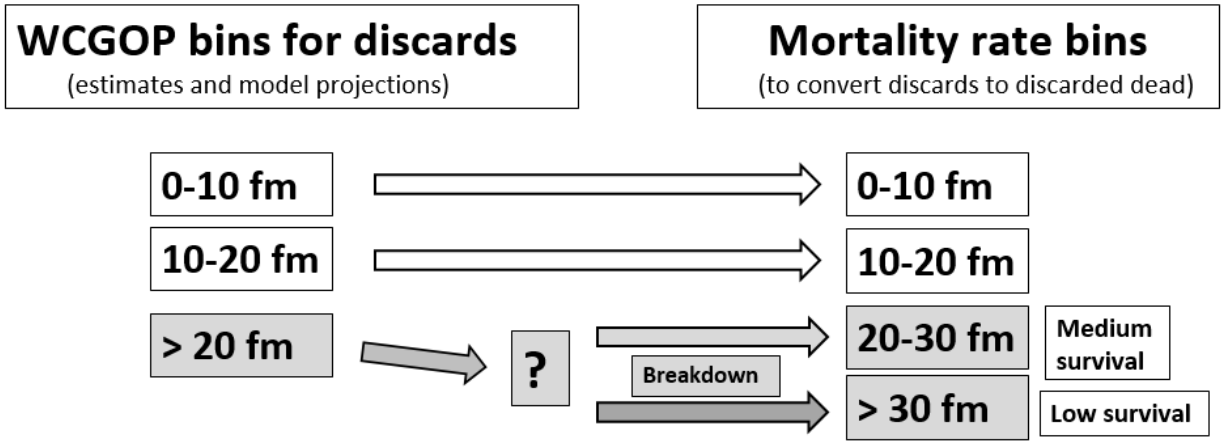

Figure 3. If the Council eliminates the 100 percent discard mortality rate assumption for jig and pole gears in >20 fathoms, then there will be two new mortality rate depth bins (i.e., 20-30 fathoms and >30 fathoms) that will compel a change in the WCGOP depth strata.

Based on the challenges that potentially creating a new depth bin creates, the GMT and WCGOP discussed two remedies to the depth bin mismatch dilemma at the January 2017 GMT meeting. Option 1 would be for the WCGOP to create an additional depth stratum for estimating their discards to match the four discard mortality rate bins (Figure 4). While this would be a straightforward solution, the GMT believes that WCGOP has concerns with Option 1 as it would create a confidential depth stratum for their discards, which could not be displayed in the Groundfish Total Mortality Report. As such, there may be an aversion to this approach, though it may be possible that mortality rates could be reported on a different level of stratification. Being transparent in the production of data products is of high value to the WCGOP, and constituents, since fisheries are managed based on this data.

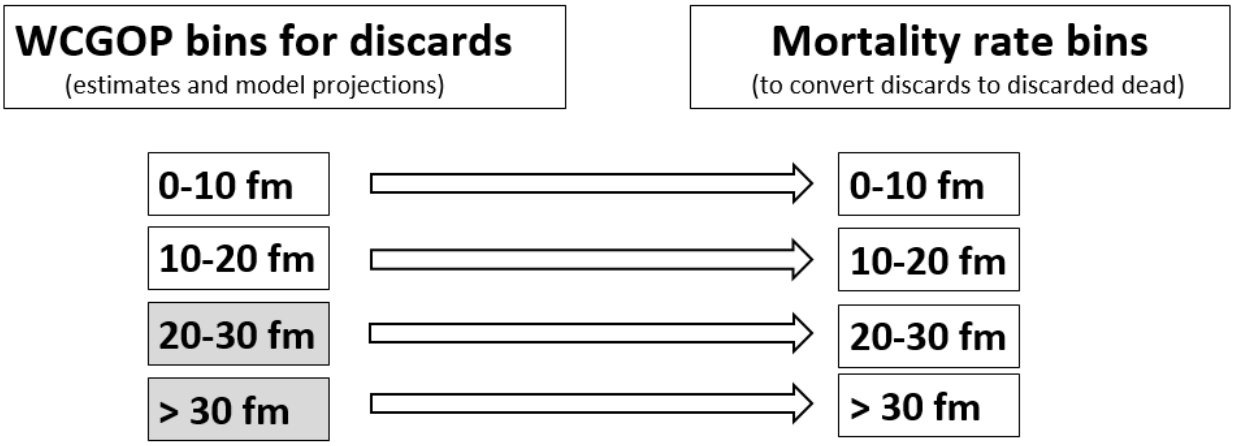

Figure 4. Option 1 resolution would be for WCGOP to add a new depth stratum (i.e., >20 fathoms changes to 20-30 fathoms and >30 fathoms) to conform with the four depth bins recommended by the GMT.

Option 2 would maintain the current three depth strata, but with the >20 fathoms mortality rate bin reflecting the proportional discards that occur in the 20-30 fathoms and >30 fathoms depth bins (Figure 5). In other words, the GMT would partition the WCGOP >20 fathoms discards into 20-30 fathoms and 30 fathoms (based on depth proportions from observed trips) and apply the respective gear-specific mortality rates in proportion to occurrence of gear type. The team would then create a summed singular >20 fathoms mortality rate that appropriately reflects proportional occurrences to the intermediate mortality 20-30 fathom depth bin and the high mortality >30 fathoms depth bin. While Option 2 may appear more complex than Option 1, it is still a rather straightforward approach. Option 2 would simply be an extension of the current proportional gear use methodology the GMT uses to blend the gear-specific mortality rates in the shallower depth bins.

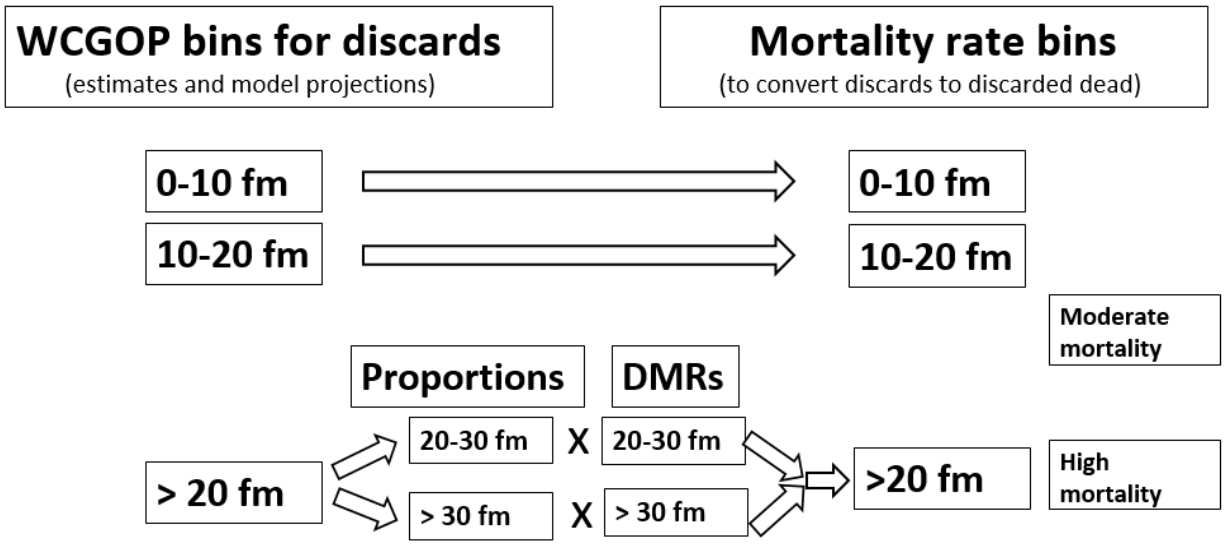

Figure 5. Option 2 would maintain the current three WCGOP depth strata for confidentiality purposes, but with the >20 fathoms mortality rate bin reflecting the proportional discards that occur in the 20-30 fathoms and >30 fathoms depth bins.

In summary, the two options for accounting for Alternative 1 (without the 100 percent mortality assumption) discard mortality rates are:

OPTION 1: Request WCGOP add an additional depth strata as in Figure 4.
OPTION 2: Maintain current strata and use the modified proportion approach as in Figure 5

If the Council selects Alternative 1, for revising surface discard mortality rates, the GMT recommends the Council consider Option 2 for applying those mortality rates. If the Council selects No Action for the mortality rates, then no changes are needed.

The GMT discussed both options with WCGOP, and believe Option 2 meets our needs based on the current fishery. Due to current rockfish conservation area (RCA) configurations, there is only trace activity in >30 fathoms (e.g., less than 0.2 percent of nearshore commercial effort in Oregon). Therefore, the observations of discards in depths >20 fathom bins essentially represent effort in the 20-30 fathom depth zone that would correspond well with the Alternative 1 mortality rates (i.e., nearly all the >20 discards would have the 20-30 fathom rate applied).

However, the GMT believes that Option 1 would be more statistically robust if the nearshore fishery were to expand into greater depths. That is because fewer assumptions would be used regarding the proportions of discards by depth. Further, if the nearshore fishery were to expand into greater depths, then there would be an increased chance that the >30 fathom depth bin would have enough activity as to no longer be confidential for reporting in the WCGOP annual mortality report.

Section 3: Consider adoption of descending devices credits for 'sport like gears' in the commercial nearshore fishery

In 2014, the SSC endorsed and the Council adopted, discard mortality rates for cowcod and canary and yelloweye rockfish for use in the recreational fishery reflecting the use of descending devices. Rates were based on a GMT Bayesian hierarchical model that incorporates short-term mortality, long-term mortality, and unaccounted mortality (Agenda Item D.3.b., GMT Report, March 2014). As displayed in Table 2 (which reflects the rates adopted for the recreational fishery), the use of descending devices is beneficial for conservation, as the devices are shown to increase survival, and increase opportunity (increased survivability of discarded fish may reduce bycatch mortality constraints).

Table 2. Comparison of discard mortality rates for select rockfish released at the surface and for those released with descending devices.

Depth bin	Canary Rockfish		Yelloweye Rockfish		Cowcod	
(fathoms)	Surface	Descender	Surface	Descender	Surface	Descender
0-10	21%	21%	22%	22%	21%	21%
10-20	37%	25%	39%	26%	35%	35%
20-30	53%	25%	56%	26%	52%	52%
30-50	100%	48%	100%	27%	100%	57%
>50	100%	100%	100%	100%	100%	100%

Currently, descending device discard mortality rates for the recreational fishery have only been adopted for yelloweye rockfish, canary rockfish, and cowcod. The GMT noted that if descending device rates were approved for the nearshore constrain the nearshore fishery. Canary rockfish are no longer constraining as they are now rebuilt; fishery, then the benefits would be greater for yelloweye rockfish since they and cowcod are too deep to be encountered by the nearshore fishery. Therefore, it would be most beneficial to prioritize yelloweye rockfish. However, if the Council were to consider adopting descending device discard mortality rates for the nearshore fishery, the GMT could not identify a reason to limit the action to select species. The uncertainties and logistical challenges associated with adopting and applying descending device discard mortality rates (e.g., incorporation into WCGOP estimation procedures) would be similar for all species.

At our January 2017 meeting, the GMT discussed the appropriateness of applying the recreational mortality rates reflecting the use of descending devices to the commercial nearshore fishery but, were unable to come to a consensus at this time. While the commercial and recreational fisheries do share some similarities (as described above), there are also differences which need to be considered. It should also be noted, that while the commercial nearshore fishery is permitted to use other gear types (i.e. long-line and trap), rates reflecting the use of descending devices would only be applicable to 'sport like' jig and pole gears.

Some on the GMT felt that there may be differences in how the fish are handled in the two fisheries, particularly with regard of how descending devices would be used. This was briefly noted by the GMT in April 2013 (Agenda Item D.5.b, GMT Report, April 2013).

The commercial nearshore fishery is primarily a live fish fishery, where the priority is more likely to be focused on ensuring viability of retained catch which requires more time than simply discarding at the surface. This is likely to result in differences in handling when compared to the recreational fishery, particularly when descending devices are used. In the commercial nearshore fishery for example, fish are immediately unhooked and those retained fish are placed in a live well with discards likely placed on deck. Participants are then likely to attend to retained catch suffering from barotrauma, prior to descending any un-retained catch. As a result, fish may spend more time on deck prior to being released with a descending device in the commercial nearshore fishery than in the recreational fishery, potentially decreasing survival.

Additionally, differences in gear restrictions may also cause deviations from the rates approved for the recreational fishery. For example, fewer hooks are allowed in the recreational fishery compared to the commercial nearshore fishery, it is likely that the recreational participants will encounter fewer fish and can focus on descending discarded catch in a more timely fashion[1].

Others on the GMT felt that commercial participants may have more experience handling fish and be able to descend fish more quickly than some private anglers thereby increasing survivorship. Commercial participants may also have fewer 'active' lines and may be able to descend fish more quickly than their recreational counterparts, particularly on charter vessels which may have one deck hand available to descend fish for numerous anglers.

Additionally, the GMT discussed the current rate of observer coverage and observed usage of descending devices in the commercial nearshore fishery. According to WCGOP data from 2004 to 2015, coastwide observer coverage in the nearshore sector has not exceeded seven percent. Many nearshore participants utilize smaller vessels (e.g., kayaks in California), which may not be able to accommodate observers. However, many of these smaller vessels are more likely to use "sport like gears" and therefore it will be important to address factors that ensure descending device use is not under or over reported.

The rate of observed descending device use in the commercial nearshore fishery has been low, with about two percent of discarded rockfish released using a descending device. The majority (96 percent) of released rockfish are discarded at the surface (57 percent) or vented (39 percent). It should be noted that the GMT understands that these data may have not been regularly collected in the early years of CGOP although it is our understanding these data are now becoming more frequently recorded.

After considering the differences between the fisheries, the GMT discussed what the potential pathways forward for implementation might be, if the Council expressed interest in this item. Some felt that that descending device usage may increase, provided there is an incentive for their use (i.e. rates are adopted). The GMT notes that usage rates initially increased in the recreational fishery after the Council approved descending device use credits; however, rates decreased afterwards in some regions.

[1] The recreational fishery is restricted to two or three hooks (California and Oregon, respectively). The commercial fishery in California is restricted to 15 hooks per line, with a limit of 150 hooks per vessel; there is no limit on the number of hooks in Oregon.

Moving forward, the GMT discussed two potential pathways. First, if the Council decides that the rates approved for fisheries reflecting the use of descending device is appropriate for the commercial nearshore fishery, they could approve these same rates for use in the commercial nearshore fishery. Some on the GMT felt this may be appropriate, as the differences described above are not sufficient to deviate from the rates approved for the recreational fishery. Therefore, the GMTs believes this may be more of a policy decision at this time. Should the Council wish to apply the approved recreational rates to the commercial nearshore fishery, it is the GMT's understanding that this would not require further SSC review.

However, others on the GMT felt that the recreational rates may not be appropriate for use in the commercial nearshore fishery, given the paucity of data and potential differences in handling. It is the GMTs understanding, at this time, that there may not be any new information available to help inform this decision. It was thought by some that more information and work is needed to address these outstanding issues. Therefore, should the Council feel that the rates approved for recreational fisheries are not applicable for the commercial fishery at this time, the GMT could alert the Council when new information does become available to help inform the appropriate rates. It should be noted that this approach would likely need SSC review once any new rates are identified.

Overall, the GMT was not able to reach a consensus on the use of recreational mortality rates reflecting the use of descending devices for the commercial nearshore fishery. Further, our conversation focused on the appropriateness of the recreational rates in the commercial nearshore fishery, and as such, we did not discuss to which species these rates would be applied. Should the Council wish to move forward with the application of the recreational rates, the GMT can provide input as to which species should be included, currently cowcod, canary rockfish and yelloweye rockfish have rates in the recreational fishery.

As laid out above, there are a multitude of variables which will need to be considered in moving forward. Regardless of either option, the GMT and WCGOP would need to develop a plan on how these rates would be implemented and incorporated for use in management. All of which would have an associated workload which may need to be considered and balanced with existing and planned workload priorities.

As a result**, the GMT requests that the Council consider whether the approved rates for the recreational fishery reflecting the use of descending devices should be used for the commercial nearshore fishery**.

GMT Recommendations:

- **The GMT therefore recommends the Council consider selecting Alternative 1 for commercial nearshore jig and pole gears use of the SSC endorsed rates in the 20 to 30 fathoms depth bin.**
- **If the Council selects Alternative 1, for revising surface discard mortality rates, the GMT recommends the Council consider Option 2 for applying those mortality rates.**
- **The GMT requests that the Council consider whether the adopted recreational rates reflecting the use of descending devices should be used for the commercial nearshore fishery**.

Appendix 1. Power Point form the GMT proposed surface discard mortality rates SSC review in 2008

DISCARD MORTALITY MATRIX FOR OCEAN AND ESTUARY RECREATIONAL FISHERIES

Groundfish Management Team, April 2008

Presented by
E.J. Dick (NMFS SWFSC) and John Budrick (CDF&G)

1

Background

- June 2007: council endorsed development of mortality rates by species and depth ("discard mortality matrix")
- Consistent method among the states
- Timeline: "In time to be analyzed in the 2009-2010-harvest specification and management measures NEPA document"

  Translation: this week

2

Method

- Partition mortality into 3 components
  1. Surface (released dead or alive)
  2. Short term (1-5 days)
  3. Long term (>5 days)

3

Surface mortality data

- CRFS/ORBS Onboard Observer Program
- Mexico to the Oregon/Washington border
- 2003 – 2007
- Fish classified as alive (swim down) or dead (float or bleeding from gills)
- Average drift depth ≈ depth of capture

4

Sample sizes by spp./depth

	DEPTH BIN [FATHOMS]				
	10	20	30	40	50
Black	254	303	11		
Blue	136	632	108	17	4
Bocaccio		19	15	19	66
Brown	141	89	1	1	
Calico	1	40	38	5	
Canary	10	249	225	10	1
Copper	5	43	5		
Gopher	19	76	3	2	
Grass	3	2	7		
kelp	18	10			
Olive	48	57	6	2	
Tiger			76		
Treefish	29	66	4		
Vermilion	3	67	8	4	5
Widow		2	14	3	2
Yelloweye	2	26	66	4	
Yellowtail	14	210	174	12	5

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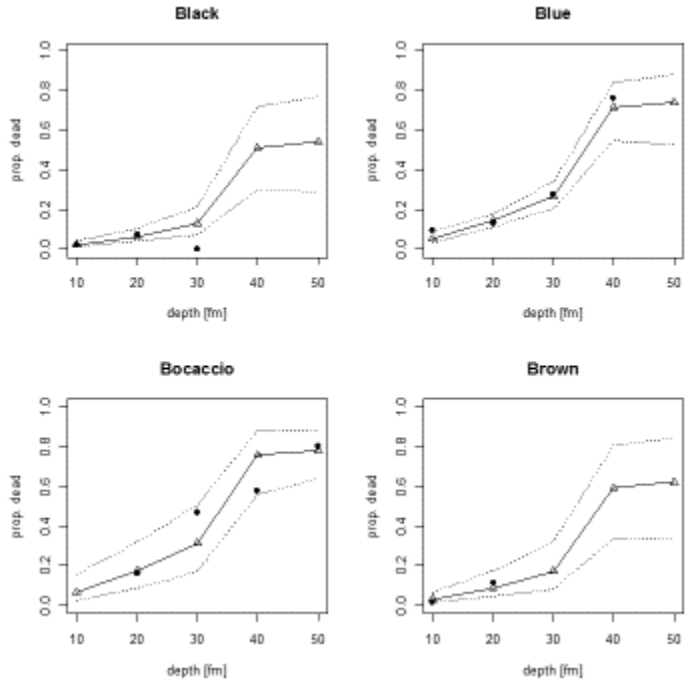

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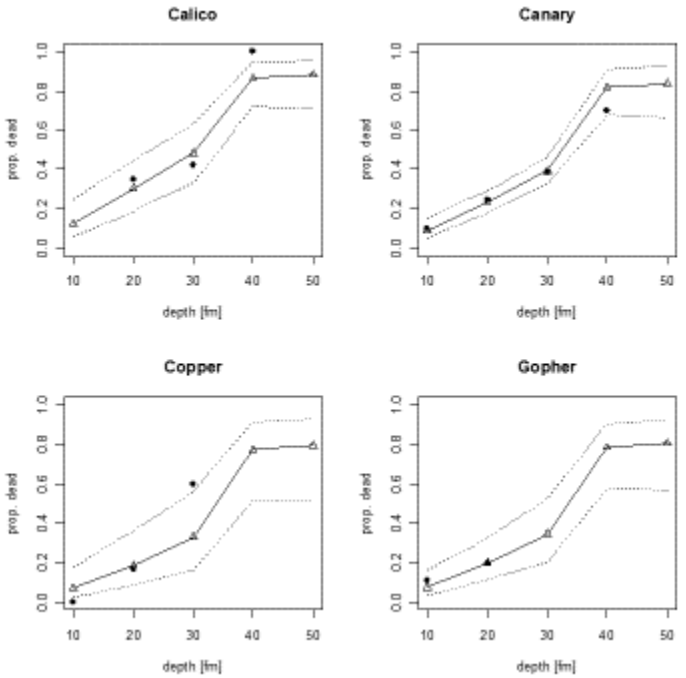
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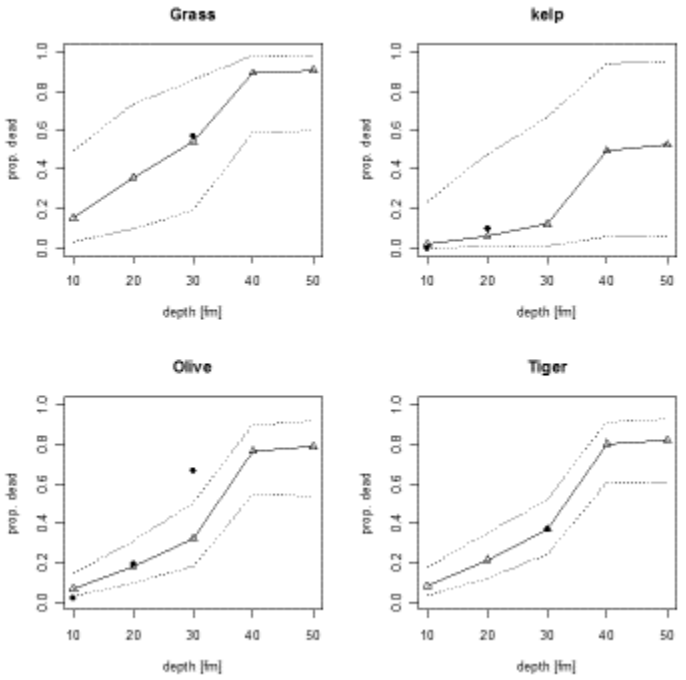
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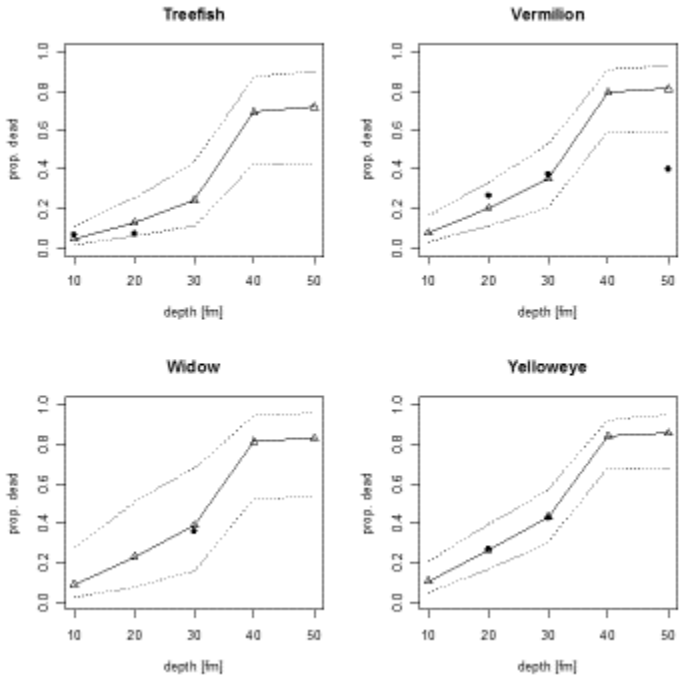
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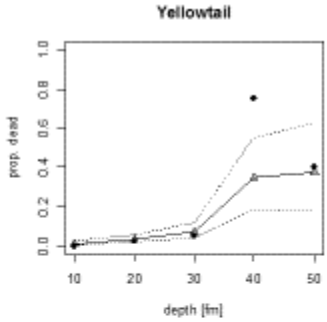
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Guild-based estimates

- Produce estimates for unobserved species, or species with sparse data
- Guilds based on depth and orientation in water column

Guild	Species Included in Guild (RF=Rockfish)
Shallow Pelagic	Black RF, Olive RF, Yellowtail RF
Shallow Demersal	China RF, Brown RF, Black and Yellow RF, Grass RF, Kelp RF, Treefish.
Deep Pelagic	Bocaccio RF, Widow RF, Canary RF, Blue RF
Deep Demersal	Vermilion RF, Copper RF, Yelloweye RF, Gopher RF, Quillback RF

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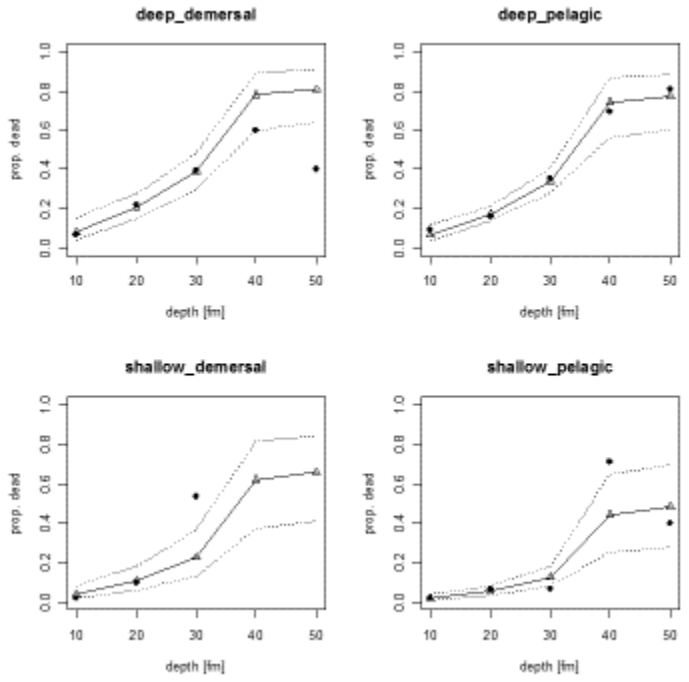

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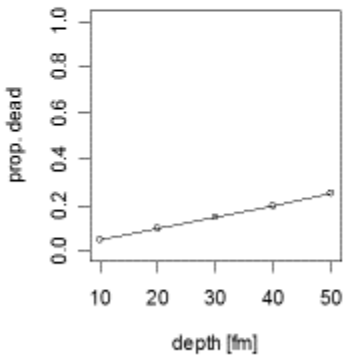
Additional mortality

- Short term,1-5 days (some data)
- Albin and Karpov (1996)
- Deep spp.: +8.33%
- Shallow: +4.55%

- Long-term, >5 days (unobservable)



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Results

- Table 13
  GLM + short-term adj. + long-term adj.
- Table 14
  = Table 13, rounded to nearest 5%

14

Appendix 2. SSC recommendations and subsequent GMT modifications for surface discard mortality rates

Where we left off…

Sp. Group	SPECIES	0-10	11-20	21-30	>30
Rockfish*	Black Rockfish	10%	20%	35%	75%
	Black and Yellow Rockfish	15%	25%	45%	100%
	Blue Rockfish	20%	35%	50%	100%
	Bocaccio	20%	35%	55%	100%
	Brown Rockfish	15%	25%	35%	100%
	Calico Rockfish	25%	50%	70%	100%
	Canary Rockfish	20%	40%	65%	100%
	China Rockfish	15%	25%	45%	100%
	Copper Rockfish	20%	35%	55%	100%
	Gopher Rockfish	20%	40%	60%	100%
	Grass Rockfish	15%	25%	45%	100%
	Kelp Rockfish	10%	20%	30%	100%
	Olive Rockfish	35%	55%	75%	100%
	Quillback Rockfish	20%	40%	60%	100%
	Tiger Rockfish	20%	40%	60%	100%
	Treefish	15%	30%	45%	100%
	Vermilion Rockfish	20%	40%	60%	100%
	Widow Rockfish	20%	40%	60%	100%
	Yelloweye Rockfish	25%	45%	65%	100%
	Yellowtail Rockfish	10%	20%	25%	60%

1

SSC Recommendation #1

- **Don't add probabilities**

WRONG:

surface + short-term + long-term

- **Rather, multiply survival probabilities for each stage of mortality**

RIGHT:

S = (1 - surface)(1 - short-term)(1 - long-term)

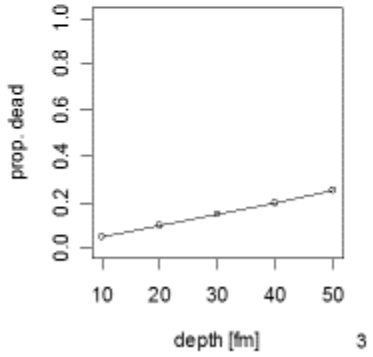
M = 1 - S

2

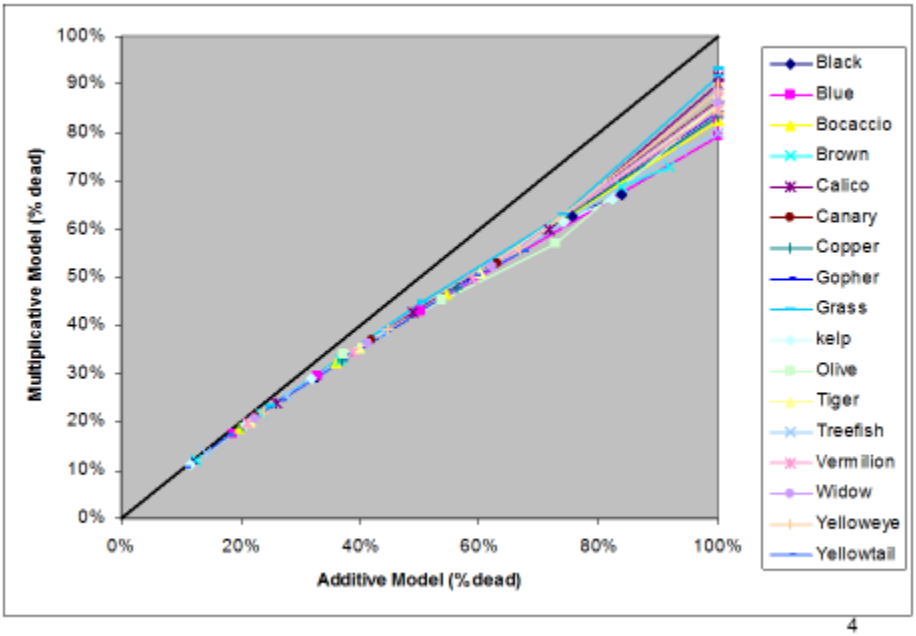
Additional mortality (unchanged)

- Short term,1-5 days (some data)
- Albin and Karpov (1996)
- Deep spp.: 8.33%
- Shallow: 4.55%

- Long-term, >5 days (unobservable)
- 5% per 10-fm bin



3



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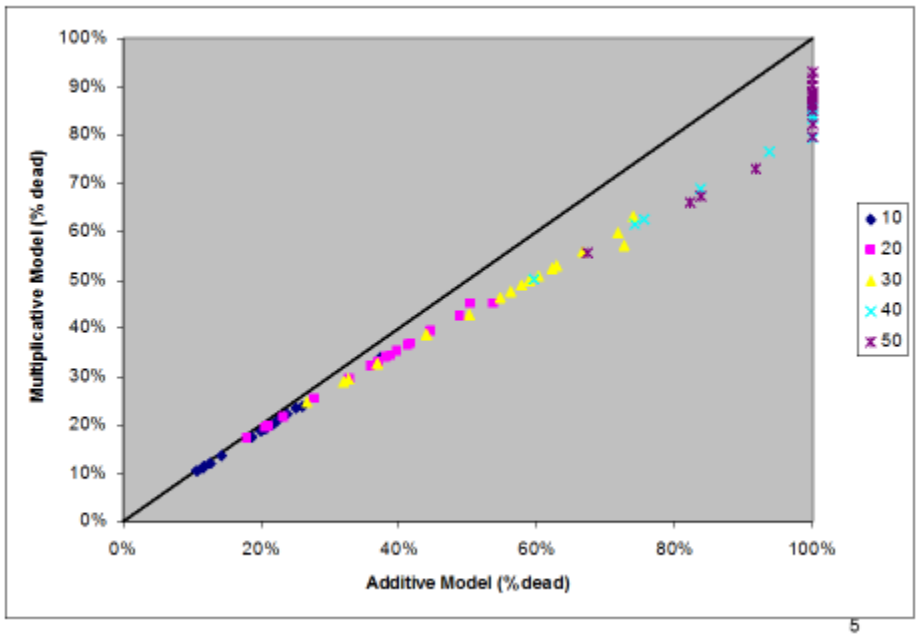

5

Multiplicative Model – point estimates

	DEPTH BIN [FATHOMS]				
	10	20	30	40	50
Black	11%	20%	29%	63%	67%
Blue	18%	30%	43%	79%	82%
Bocaccio	19%	32%	46%	82%	85%
Brown	12%	22%	33%	69%	73%
Calico	24%	43%	60%	90%	92%
Canary	21%	37%	53%	87%	89%
Copper	19%	33%	48%	83%	86%
Gopher	19%	34%	49%	84%	87%
Grass	23%	45%	63%	92%	93%
kelp	11%	19%	29%	61%	66%
Olive	34%	45%	57%	86%	88%
Tiger	20%	35%	51%	86%	88%
Treefish	14%	25%	39%	76%	80%
Vermilion	20%	34%	50%	85%	87%
Widow	21%	36%	52%	86%	89%
Yelloweye	22%	39%	56%	88%	90%
Yellowtail	10%	17%	25%	50%	55%

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Multiplicative Model – upper 95% C.I.

	DEPTH BIN [FATHOMS]				
	10	20	30	40	50
Black	13%	23%	36%	79%	84%
Blue	21%	32%	49%	88%	92%
Bocaccio	26%	44%	61%	92%	92%
Brown	15%	29%	45%	85%	89%
Calico	34%	55%	71%	96%	97%
Canary	27%	42%	59%	93%	95%
Copper	28%	48%	66%	94%	95%
Gopher	27%	44%	63%	93%	95%
Grass	54%	77%	88%	98%	99%
kelp	31%	55%	73%	95%	96%
Olive	39%	54%	69%	94%	96%
Tiger	28%	47%	62%	94%	95%
Treefish	20%	36%	54%	90%	93%
Vermilion	28%	45%	64%	93%	95%
Widow	37%	60%	75%	96%	97%
Yelloweye	31%	50%	67%	95%	96%
Yellowtail	12%	19%	29%	66%	73%

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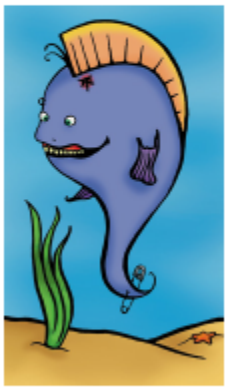
SSC Recommendation #2

- Check if the species within each guild are happy with their guild-mates
- Answer: Yes, they are.
- Except for canary.



- Solution:
  Remove canary from deep-pelagic guild

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Revised Guild Definitions

Guild	Species Included in Guild (RF=Rockfish)
Shallow Pelagic	Black RF, Olive RF, Yellowtail RF
Shallow Demersal	~~China RF,~~ Brown RF, ~~Black and Yellow RF,~~ Grass RF, Kelp RF, Treefish.
Deep Pelagic	Bocaccio RF, Widow RF, ~~Canary RF,~~ Blue RF
Deep Demersal	Vermilion RF, Copper RF, Yelloweye RF, Gopher RF, ~~Quillback RF,~~ Tiger RF

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Guild-based Estimates

Multiplicative model -- best estimates

	DEPTH BIN [FATHOMS]				
	10	**20**	**30**	**40**	**50**
deep_demersal	21%	35%	52%	86%	89%
deep_pelagic	18%	30%	45%	80%	84%
shallow_demersal	13%	24%	37%	74%	79%
shallow_pelagic	11%	19%	29%	60%	66%

Multiplicative model -- upper 95% C.I.

	DEPTH BIN [FATHOMS]				
	10	**20**	**30**	**40**	**50**
deep_demersal	28%	41%	60%	94%	95%
deep_pelagic	23%	33%	52%	90%	92%
shallow_demersal	17%	31%	50%	89%	91%
shallow_pelagic	13%	21%	34%	77%	81%

10

Same procedure as last time…

- Combine 40 & 50 fathom bins into “>30”
- Assign 100% mortality to >30 bin, except for yellowtail and black
- Yellowtail and black use 40-fathom estimate for >30 bin
- Species with little or no data use guild-based estimates

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Comparison by species & depth

- Old table

	10	20	30	>30
Black	10%	20%	35%	75%
Black and Yellow	15%	25%	45%	100%
Blue	20%	35%	50%	100%
Bocaccio	20%	35%	55%	100%
Brown	15%	25%	35%	100%
Calico	25%	50%	70%	100%
Canary	20%	40%	65%	100%
China	15%	25%	45%	100%
Copper	20%	35%	55%	100%
Gopher	20%	40%	60%	100%
Grass	15%	25%	45%	100%
Kelp	10%	20%	30%	100%
Olive	35%	55%	75%	100%
Quillback	20%	40%	60%	100%
Tiger	20%	40%	60%	100%
Treefish	15%	30%	45%	100%
Vermilion	20%	40%	60%	100%
Widow	20%	40%	60%	100%
Yelloweye	25%	45%	65%	100%
Yellowtail	10%	20%	25%	60%

- New table

10	20	30	>30
11%	20%	29%	63%
13%	24%	37%	100%
18%	30%	43%	100%
19%	32%	46%	100%
12%	22%	33%	100%
24%	43%	60%	100%
21%	37%	53%	100%
13%	24%	37%	100%
19%	33%	48%	100%
19%	34%	49%	100%
23%	45%	63%	100%
11%	19%	29%	100%
34%	45%	57%	100%
21%	35%	52%	100%
20%	35%	51%	100%
14%	25%	39%	100%
20%	34%	50%	100%
21%	36%	52%	100%
22%	39%	56%	100%
10%	17%	25%	50%

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Net Effect; Old minus New

	10	20	30	>30
Black	-1.4%	0.3%	5.5%	12.4%
Black and Yellow	1.8%	1.4%	7.7%	0.0%
Blue	2.4%	5.4%	7.1%	0.0%
Bocaccio	1.4%	3.0%	8.6%	0.0%
Brown	2.9%	3.3%	2.2%	0.0%
Calico	1.1%	7.3%	10.2%	0.0%
Canary	-0.9%	3.1%	12.1%	0.0%
China	1.8%	1.4%	7.7%	0.0%
Copper	0.9%	2.1%	7.3%	0.0%
Gopher	0.5%	6.2%	11.0%	0.0%
Grass	-8.3%	-20.0%	-18.1%	0.0%
Kelp	-1.2%	0.6%	1.1%	0.0%
Olive	0.9%	9.8%	17.9%	0.0%
Quillback	-0.6%	5.1%	7.9%	0.0%
Tiger	-0.1%	4.7%	9.2%	0.0%
Treefish	1.4%	4.6%	6.3%	0.0%
Vermilion	0.3%	5.6%	10.2%	0.0%
Widow	-0.7%	3.6%	7.6%	0.0%
Yelloweye	2.9%	5.7%	9.1%	0.0%
Yellowtail	-0.4%	2.9%	0.3%	9.7%

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SSC Recommendation #3 (for later)

- Confirm that discard mortalities based on CPFV data are representative of other modes (e.g. private boat)
  1. Compare RecFin CPFV mortality data to Type 3d data. If similar result, assume RecFin is representative.
  2. With RecFin data, compare mortalities among sectors

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